

INTEX-NA Flight10: July 20, 2004

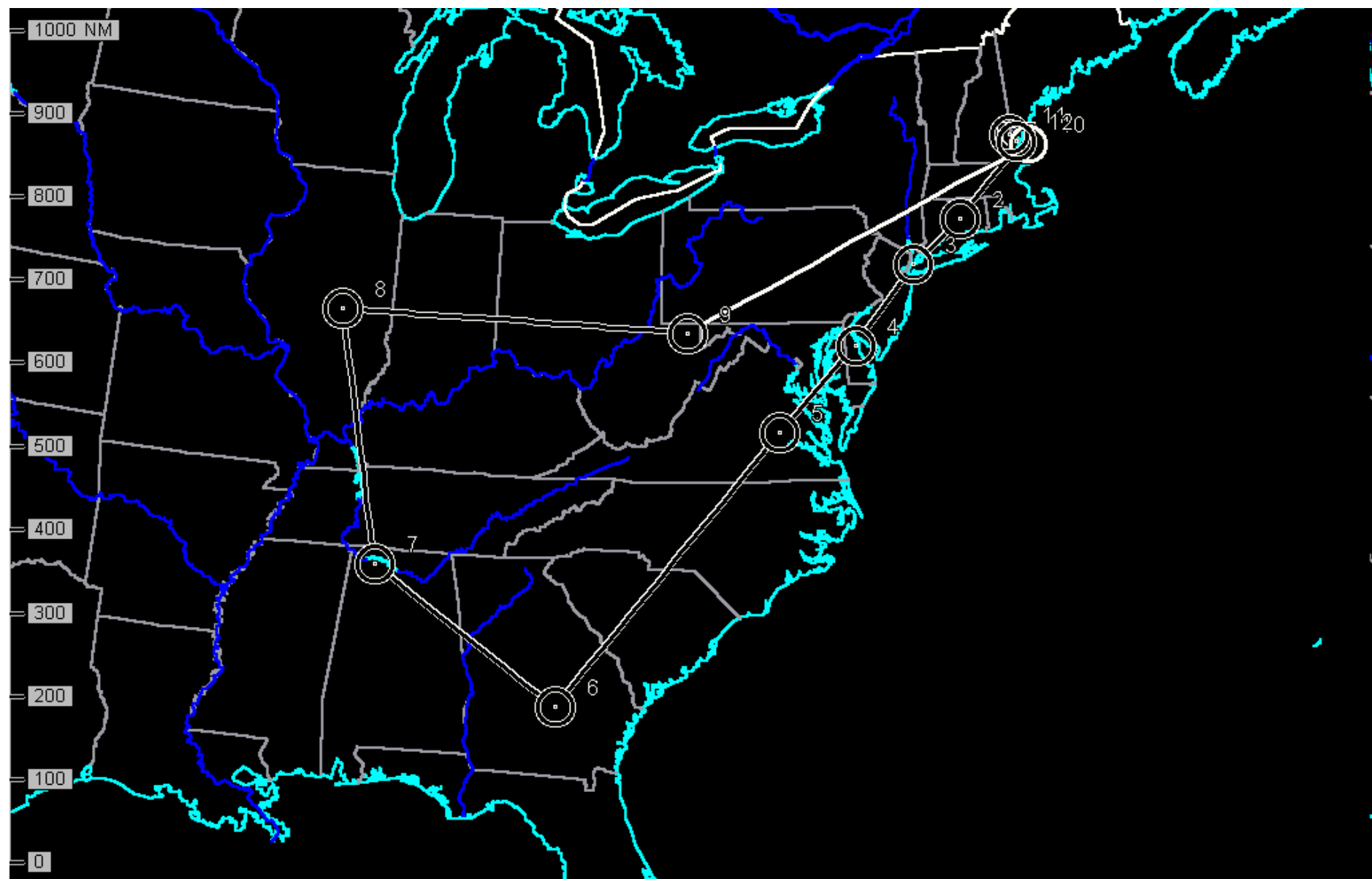
This was the second DC-8 science flight from Pease AFB New Hampshire. The flight was focused on intercepting smoke from Alaskan fires over the US. Salient science objectives were validation of Aqua (AIRS, MODIS) instruments, characterization of smoke from Alaskan fires transported over the US, boundary layer pollution over the southeast and mid-west, and a coordinated radiation closure experiment with the J-31. The flight was guided by meteorological analysis and forecasts from multiple models and was adjusted using in-flight guidance provided by the UV lidar. Total flight duration was 8.5 hours with a 1015 h (1415 UT) take off time. Basic flight patterns and there location are shown in the slides below.

Most of the flight occurred between two surface systems. An old stagnant frontal boundary was located off the Atlantic Coast. An advancing frontal system extended from southeast of Hudson Bay, over the Great Lakes, and over northern Illinois. Surface high pressure located between these two systems produced generally fair skies over most of the flight area. The flow pattern in the middle and upper troposphere was dominated by a trough over the East Coast and a strong ridge over the Rocky Mountains. This pattern produced generally southwesterly winds over the eastern part of the flight area, and northwesterly winds over the western part of the area. The jet stream continued to be located farther south than usual. Two jet streaks influenced the area—one located east of the flight, and the second advancing over the western portion of the flight. Tropopause heights were relatively low over the east (~ 300 mb) and higher over the western portion (~ 200 mb). Convection was limited over the flight area, with only scattered storms over the northernmost leg.

At the start of the mission we headed in the southwesterly direction and after warm up at 20000 ft ascended to 31000 ft. During ascent to and descent from the 31000 ft leg we encountered several pollution layers ($O_3 > 90$ ppb) between 15000-25000 ft with extremely hazy conditions below. There were indication of smoke from fires that had been mixed with some anthropogenic pollution at somewhat lower altitudes (4-12000 ft). A rather large drawdown of CO_2 ($> 3\%$) could be observed in this region. Descent to 1000 ft saw high concentrations of anthropogenic pollution with SO_2 exceeding 15 ppb and SO_4 exceeding $15 \mu g/m^3$. The aerosol was highly absorbing and some smoke may have been present in the boundary layer as well. O_3 concentrations were moderate (50 ppb) but formaldehyde levels exceeded 7 ppb. Slow speed tests with and without flaps were performed at 25000 ft to see instrument performance at speeds necessary for BAe146 intercomparison. It was concluded that the optimum speed for this purpose was 220 knots. Descent to 1000 ft found multiple layers between 12-2000 ft with CO exceeding 220 ppb at low levels. Along with all anthropogenic pollutants HCN was elevated suggesting that biomass burning smoke was indeed present in the boundary layer. Ascent to 31 K ft at the southwesterly leg encountered heavy pollution from Alaskan fires (CO -360 ppb; O_3 -90 ppb; ΔO_3 -30 ppb) and large increases in HCN. A long surface leg on the westerly track also encountered high levels of pollution (CO -280 ppb; SO_2 - 4 ppb) with moderate O_3 (50-60 ppb) and no perceptible change in HCN. A spiral (1000-35000 ft) was conducted for AIRS validation under fairly clear conditions ($< 20\%$ cloudy) at 1900 UT. O_3 levels in the surface pollution layers continued to be low (40-60 ppb) on the northerly legs. Here between 25-3000 ft we encountered stratospheric air mixed with pollution (O_3 -140 ppb), possibly from Asia, with smoke pollution underneath (12-1500 ft; O_3 -95 ppb). DACOM/ CO instrument had some difficulty during this flight but operated during critical periods. Additional CO data are to be acquired by UC Irvine from their canister samples. Rendezvous with J-31 was cancelled by the J-31 team due to unsuitable weather conditions. Overall this was an extremely successful flight that accomplished all the anticipated objectives.

The navigational data are available at URL: <http://www.dfrc.nasa.gov/Research/AirSci/DC-8/ICATS/index.html>

DC-8 NASA 817 INTEX 20 JUL 04



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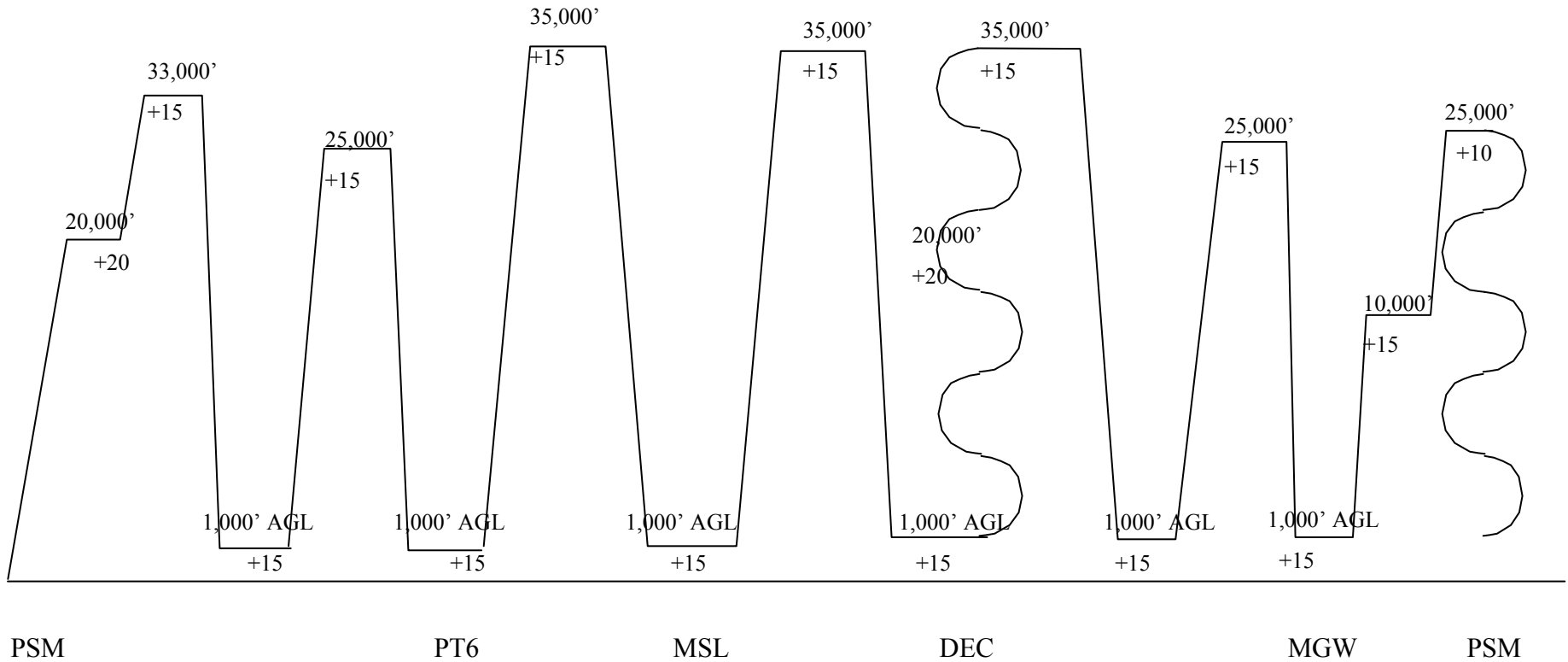
SPIRAL CLIMBS

to 10,000 msl @1,000 fpm

then 1500 fpm

ALL ENROUTE CLIMBS/DESCENTS

1500 FPM



TYPE ACFT DC-8		CALL SIGN NASA817		DATE		FROM PEASE INTL TR N 43 04.7 W070 49.4		TO PEASE INTL TR N 43 04.7 W070 49.4		PLND TO 14:15		ACT TO		PILOT		COPILOT								
TOT DIST 2392.1		TOT TIME 08+22		FUEL REQ 86154										NAVIGATOR		ENGINEER								
TP DTD#	Fix/Point Description		FREQ		Latitude Longitude		Alt Wind		TAS GS		TC MC		LEG DIST DIST REM		LEG TIME TIME REM		ETA		RETA		ATA		REMARKS	
1	KPSM/A PEASE INTL TR				N 43 04.7 W070 49.4		100M				149 165		5.0 2387		00+00 08+22		14:15							
2	HFD/E HARTFORD		096X 114.90		N 41 38.5 W072 32.9		20000M		330 330		224 239		114.0 2273		00+21 08+01		14:36							
3	LGA/E LA GUARDIA		078X 113.10		N 40 47.0 W073 52.1		20000M		330 330		229 243		78.9 2194		00+14 07+47		14:50							
4	ENO/R SMYRNA		051X 111.40		N 39 13.9 W075 31.0		20000M		330 330		219 232		120.1 2074		00+22 07+25		15:12							
5	.PT05 RIC/R296010		088X 114.10		N 37 33.1 W077 31.3		20000M		330 330		223 234		138.2 1936		00+25 07+00		15:37							
6	.PT06 DBN/R196032		078X 113.10		N 32 02.2 W082 59.8		20000M		330 330		219 227		426.7 1509		01+18 05+42		16:55							
7	MSL/R MUSCLE SHOALS		112X 116.50		N 34 42.2 W087 29.6		20000M		330 330		305 309		276.6 1233		00+50 04+52		17:45							
8	DEC/R DECATUR		119X 117.20		N 39 44.3 W088 51.4		20000M		330 330		348 350		308.6 924		00+56 03+56		18:41							
	.delay		119X 117.20		N 39 44.3 W088 51.4		20000M		330 330		348 349		0.0 924		00+35 03+21		19:16							
9	MGW/R MORGANTOWN		053X 111.60		N 39 33.4 W079 51.6		20000M		330 330		091 097		416.9 507		01+16 02+05		20:32							
10	.PT10		076X 112.90		N 43 00.0 W070 30.0		20000M		330 330		064 077		470.7 36		01+26 +40		21:57							
	.delay		076X 112.90		N 43 00.0 W070 30.0		20000M		330 330		064 080		0.0 36		00+25 +15		22:22							
11	EPDEY/W EPDEY				N 43 14.5 W070 57.5		20000M		330 330		306 322		24.8 11		00+05 +10		22:27							
12	KPSM/A PEASE INTL TR				N 43 04.7 W070 49.4		100M				149 165		11.5 0		00+10 +00		22:37							

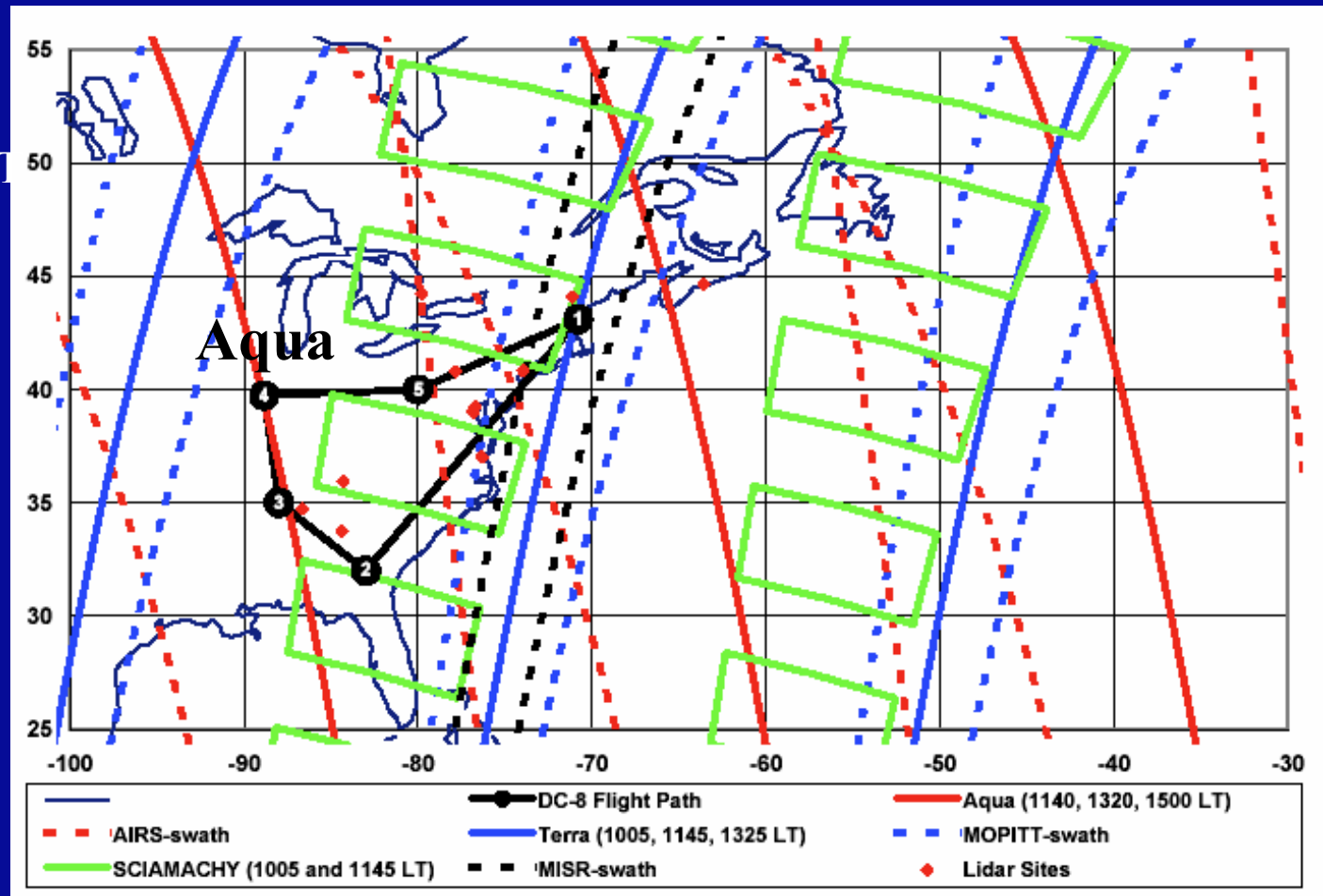
INTEX flight#10 plan – July 20, 04

Take off: 1015 LT
Briefing: 0830 LT
Door Close: 0930 LT
Flt Duration: 8.5 h

Point	Latitude	Longitude
1	43.1	-70.8
2	32	-83
3	35	-88
4	39.73	-88.85
5	40	-80
6	43.1	-70.8

spiral

spiral



Objectives:

1. Biomass burning, Asian, and stratospheric influences in free troposphere;
2. Boundary layer pollution in southeast and midwest U.S.;
3. Aqua validation
4. DC-8 & J 31 spiral prior to landing

GEOS Chem CO Column

